

SUPPLY POTENTIAL FOR PETROLEUM PRODUCTS IN THE U.S. GULF COAST

CONSULTANT REPORT

MARCH 2002
P600-02-006CR



Gray Davis, Governor

CALIFORNIA ENERGY COMMISSION

Prepared By:

Drew Laughlin
1516 Ninth Street
Sacramento, CA 95814
Contract No. 500-00-002

Prepared For:

Sherry Stoner

Contract Manager

Gordon Schremp

Project Manager

Pat Perez

Manager

Transportation Fuel Supply
& Demand Office

Nancy Deller

Deputy Director

Transportation Energy Division

Steve Larson

Executive Director

Task 2: Supply Potential for Petroleum Products in the USGC.

Draft

Prepared for:

The CALIFORNIA ENERGY COMMISSION

By:

**James Drew Laughlin
March 14, 2002**

DISCLAIMER

This report has been prepared by Drew Laughlin for the sole benefit of the California Energy Commission. Neither the report nor any part of the report shall be provided to third parties without the written consent of Drew Laughlin. Any third party in possession of the report may not rely on its conclusions without the written consent of Drew Laughlin.

Drew Laughlin conducted the meetings with industry participants and prepared this report using reasonable care and skill in applying methods of analysis consistent with normal industry practice. All results are based on information available at the time of presentation. Changes in factors upon which the report is based can affect the results. Forecasts are inherently uncertain because of events that cannot be foreseen, including the actions of governments, individuals, third parties and competitors. NO IMPLIED WARRANTY OF MERCHANTABILITY SHALL APPLY.

Purpose

The purpose of this work is to support California Energy Commission (CEC) staff in research mandated by AB 2098. AB 2098 directs the CEC to examine the feasibility of financing, constructing and maintaining a new pipeline or utilizing or expanding the capacity of existing pipelines to transport motor vehicle fuel or its components from the U.S. Gulf Coast (USGC) to California. This pipeline analysis has been broken into the five tasks described below:

- Task 1. Petroleum product pipeline fundamentals and economics.
- Task 2. Supply potential for petroleum products in the USGC.
- Task 3. Marine product tanker fundamentals, economics and outlook.
- Task 4. Petroleum product pipeline system modifications, costs, benefits, and funding mechanisms.
- Task 5. Cost/benefit summary and additional areas of concern.

This report covers Task 2.

Introduction

In order to determine the economic feasibility of a pipeline from the USGC to California the capability of the USGC refining industry to supply refined products for shipment to California must first be determined. Banning MTBE from California gasoline in 2003 may create a need to import as much as 100,000 barrels per day of finished product and/or blending stocks into California. This report is broken into 3 sections:

- A. Refinery capacity assessment which examines the current utilization of Gulf Coast refineries and their ability to supply product for shipment to California.
- B. Import assessment which discusses how product imports either to the East Coast or the Gulf Coast can free product for shipment to California.
- C. Issues that could impact supply that could either adversely or positively impact the ability of Gulf Coast refiners to make product for shipment to California.

This report examines the USGC refinery capacities and the overall logistics of markets that are supplied by the USGC refineries. The impacts of diverting gasoline and/or components from the traditional markets to California are analyzed, In summary, this report seeks to assess the overall availability and the conditions that will make products available to come to California.

Executive summary

Future state and federal regulatory and legislative actions will have the tendency to reduce supply of California gasoline and alternative supplies must be developed. USGC is the largest source for supplying the shortfall from within the US. The remaining shortfall will have to come from foreign sources.

USGC refiners can increase supply to California by optimizing their production rates and by letting imports displace some of their current product demand. Imports of blendstocks, RFG gasoline and conventional gasoline are currently available and can help California supply either by direct shipment to California or displacement of current USGC demand. A Texas to California pipeline would help supply and reduce California fuel costs. It would provide a link to the refined product distribution network and allow more competition between East of Rockies and California refiners. A pipeline to the West Coast will eventually be needed to offset the loss of U.S Flag ships created by OPA90.

Section A of this reports examines the USGC refinery capacities and concludes that there is no spare capacity for easily increasing the production to supply to the California's projected shortfalls. This section has a detailed analysis of the dynamics of alkylate production and availability in USGC. This is an important gasoline blendstock that is likely to play a key role in California's gasoline future. It is shown

that there is increasing competition for this valuable gasoline component and California will have to bid a significant price over the gasoline selling price to attract supplies.

The current disposition of USGC refined products in Section B reveals that the key primary market served is the East Coast States where the USGC products are pumped up the Colonial pipeline. More imports into the New York harbor can in effect free up some capacity that can then make products and components available for California. Similarly, USGC supplies Florida and other Southeast markets by marine vessels. Direct imports into these markets, although not optimal due to lack of marine terminal and other logistical facilities, can free up some USGC capacity to supply the West Coast markets. In principal, all this leads to a new macro supply demand balance which will be attained due to the higher prices for California's unique gasoline formulation.

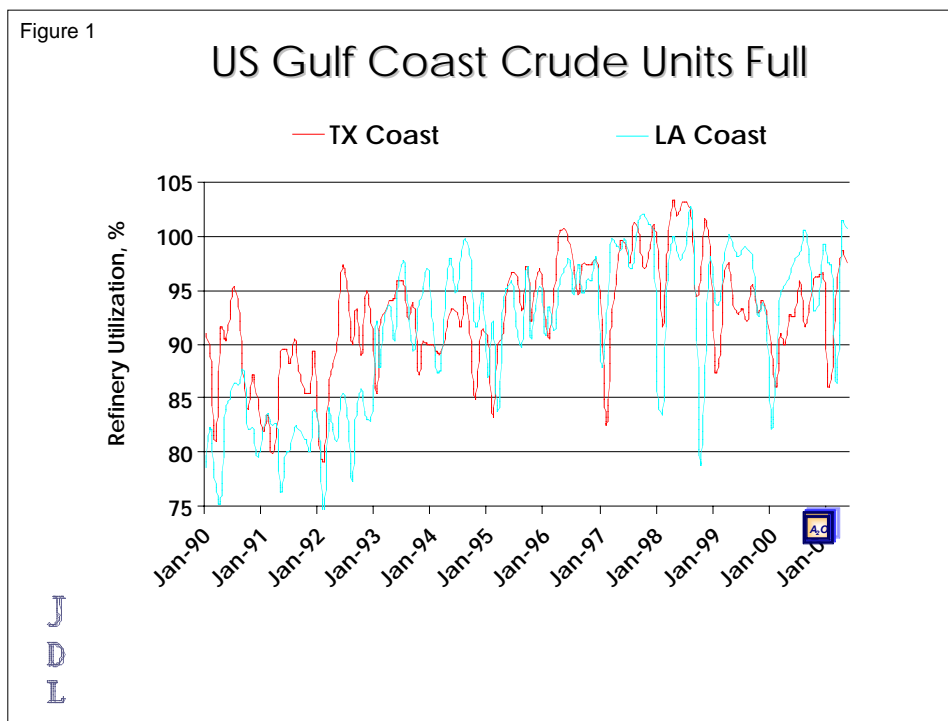
In the final part of this report, Section C lists other factors that will influence the USGC supply availability.

A. Refinery capacity assessment

The Department of Energy's (DOE) Energy Information Administration (EIA) gathers and reports information on refining capacity and utilization. The first steps in estimating the ability of USGC to supply incremental product to California is to summarize and analyze DOE/EIA's refinery utilization data.

DOE/EIA reports USGC refinery capacity and utilization data for Texas Coast (TX Coast) and Louisiana Coast (LA Coast) refining regions. Figure 1 shows the crude unit utilization rates for these regions.

For the last few years the utilization rate has typically been between 90 and 100% on a calendar day capacity basis. The utilization rate can occasionally exceed 100% when all refineries are running well. This happens because a refinery's capacity to process crude oil on any given day it is operating (stream-day capacity) exceeds that which it can average (calendar-day capacity) due to scheduled and unscheduled maintenance shutdowns. Also, the reported capacities sometimes trail actual capacity as refiners make



minor improvements and capacity creep occurs. When the rate goes below 90% either refinery margins have been depressed to the point where some refiners have a negative margin or several large refineries are

down simultaneously for maintenance. When all refineries are running there is typically excess capacity and supply competition eventually drives margins down to breakeven levels for the average refinery and to negative levels for the incremental refinery. When operating rates are below 90% typically there is not enough refined product supply to meet demand. Demand competition will drive refining margins upward until refiners increase throughput, oversupply the market, and begin to drive prices downward. At utilization rates that are averaging over 90% this region's ability to supply additional product to California is limited to:

1. Periods when it is doing better than typical calendar-day rates,
2. Unreported capacity creep or
3. Product imports into the regions usually supplied by the USGC that reduce demand for USGC refiner products.

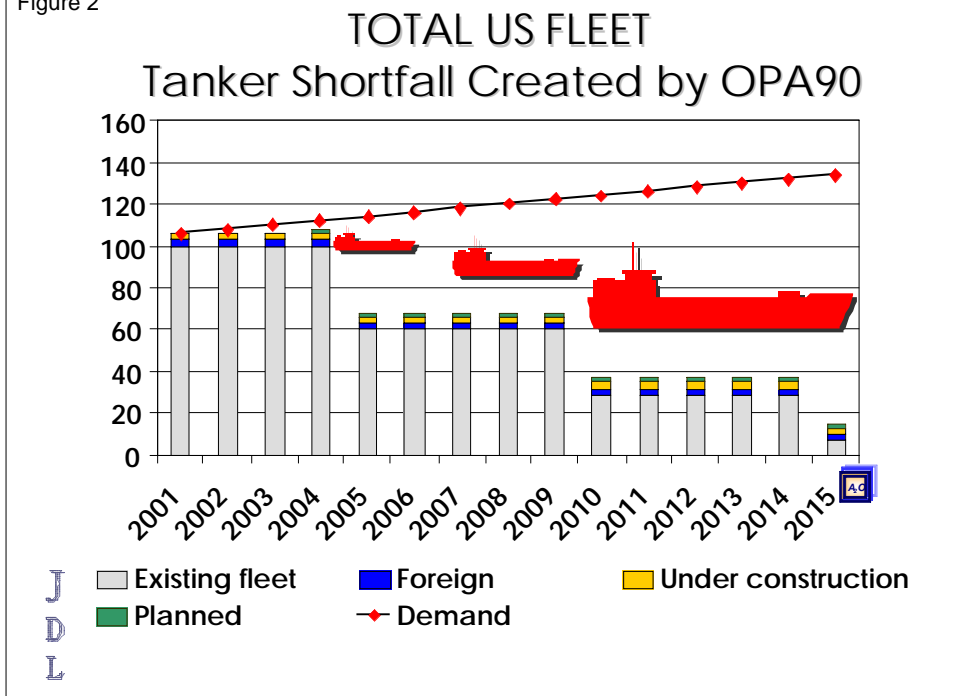
Some or all three of these occur at times. Items 1 and 2 tend to be spot or opportunistic. If the USGC is running above average when California needs the product, refiners will find a way to make and deliver product to California. When the price differential widens enough to bid the product away from its current consumer and recover the additional costs of meeting the more restrictive California fuel specifications (plus the transportation costs), the product will go to California. Item 3 evolves more slowly. If California were to routinely take 50,000 to 100,000 barrels per day of product from the USGC either via tanker or pipeline, alternate supplies for the USGC's current market would develop. In 2003 and 2004 California would have to rely upon items 1 and 2 for additional supply. If California committed to take the product long-term, tankers or a pipeline could be built so that item 3 could result in a reliable alternate supply for California. In the absence of commitment or transportation assets, item 3 will not develop into a consistent product source.

Gulf coast refiners may have difficulties producing CARB III gasoline and clean blendstocks today. However, the expected increase in California's gasoline prices should attract refinery investments to produce CARB or near-CARB type gasoline. The strict California gasoline specifications in sulfur and midpoint are particularly difficult for Gulf coast refiners today. Current RFG regulations do not weigh midpoint as heavily as the CARB formulations. This causes Gulf coast refiners to be not as concerned with distillation as a California refiner. Additionally, California CARB regulations require much lower sulfur than RFG gasoline.

If California/Arizona demands additional gasoline and the price is high enough to attract investment, Gulf coast refiners will construct additional distillation equipment and desulfurization equipment to supply the needed product. However, the market will have to demonstrate the need for the product by higher long term price differentials on the West coast versus the Gulf coast. California could see higher differentials until this new production is brought on line.

The Oil Pollution Act of 1990 (OPA90) requires the retirement of some Jones Act tankers. The tanker balance illustrated in Figure 2, indicates that unless California actively encourages the construction of tankers or a USGC to California products pipeline, it will be difficult for California to benefit from the displacement type supply that item 3 represents.

Figure 2



The fact that the crude units are full is not the complete answer concerning the USGC's ability to supply additional product to California. The DOE/EIA also reports the throughput to Fluid Catalytic Cracking (FCC) Units, Hydrocrackers and Cokers. These units are important because the direct outputs from a crude oil distillation unit are not suitable for use in modern automobile engines. They must be further processed to make the clean fuels today's cars and regulators demand. Figures 3, 4 and 5 show that these units are also operating near their capacity limits.

FCC units convert a product that is too heavy for use in either gasoline or distillate fuel oil into gasoline and distillate fuel oil. Some of the product over-cracks into molecules that are too light to be used in gasoline. Refiners typically sell one of these light products, propylene, into the petrochemical market. Another light product, butylene, is converted to alkylate which will be discussed later. The FCC gasoline tends to have too much sulfur and too many olefins to be used extensively in California gasoline until it is further processed. The distillate called light catalytic cycle oil (LCCO) has too much sulfur and too many aromatics to be used in California diesel fuel without further processing.

Fortunately Hydrocrackers can convert the LCCO into either gasoline or distillate components that can be used in California products. They also crack big molecules into smaller molecules. However, since they have hydrogen present in the cracking zone, the hydrogen tends to saturate the cracked molecules and cause the sulfur compounds to convert to hydrogen sulfide, which is easily removed. Unfortunately, hydrocracker units also tend to be at full capacity as shown in Figure 4.

Figure 3

US Gulf Coast FCC Units Full

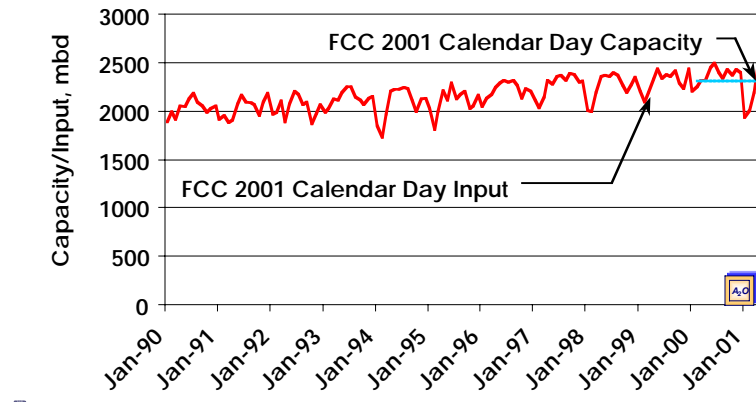


Figure 4

US Gulf Coast Hydrocrackers Full

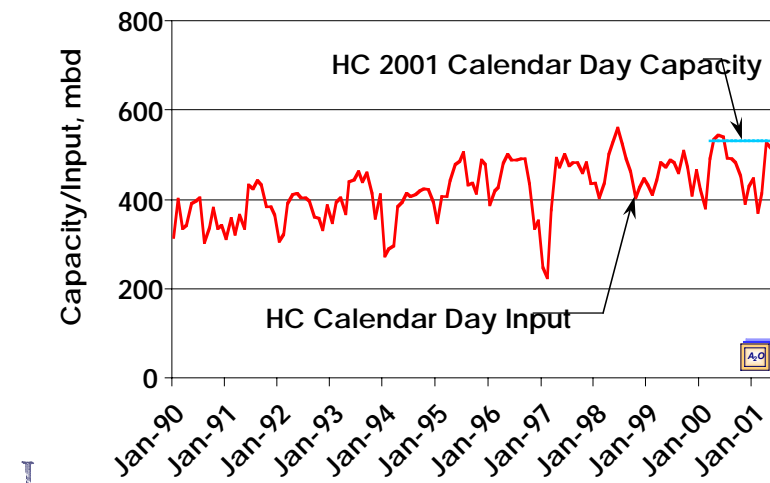
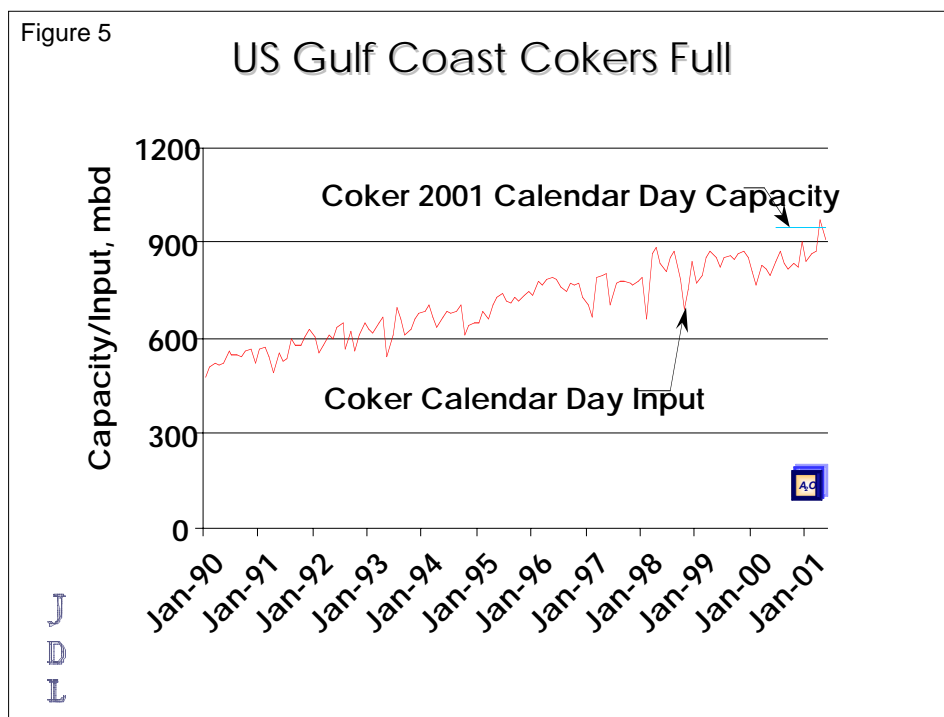


Figure 5



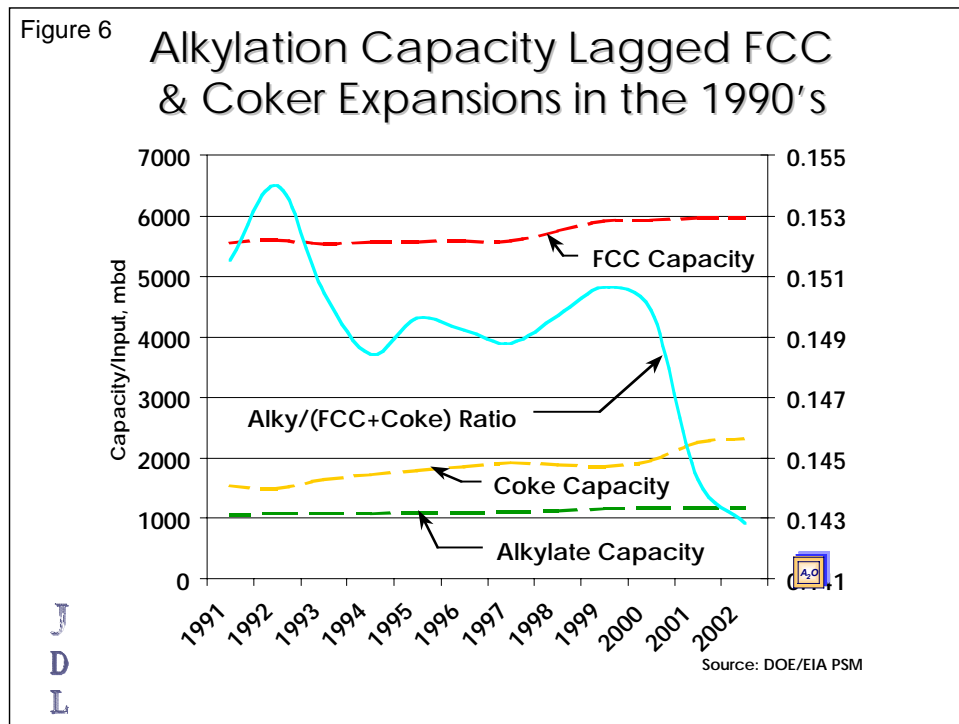
Another process for which DOE/EIA tracks throughput is coking. Coking units take the heaviest part of the crude oil that are almost tar like substance at room temperature and crack it into more useable products by adding heat. The outputs of Coking units also tend to have too much sulfur and olefins for direct use as transportation fuels. Typically FCC's and Hydrocrackers are used to further process coker products so the resulting products can be used in clean fuel applications. The USGC Cokers also tend to be at full capacity as shown in Figure 5.

Two other important refining processes are reforming and alkylation. Reformers reshape or reform low-octane molecules into high-octane aromatic molecules. Alkylation units react the small molecules like propylene and butylene that are produced in the FCC's and the coker's with isobutane to form alkylate which is a clean burning, low sulfur, isoparaffin with an octane value in the premium gasoline range. DOE/EIA does not report throughput for these units. The growth of MTBE use in reformulated gasoline has caused refiners to not build enough alkylation capacity to keep up with their increased FCC and Coker throughputs that are shown in Figures 3 and 5. MTBE is made from isobutylene that is produced in FCC's and cokers. Before MTBE, its feedstock, isobutylene, was used as alkylation feedstock. The need for MTBE to satisfy Federal RFG regulations and the low cost of MTBE plants relative to alkylation unit capacity expansions caused refiners to not expand their alkylation capacity. Figure 6 illustrates how alkylation capacity expansions have fallen behind FCC and coker expansions that produce alkylation feedstock.

From the review above, if the USGC refining capacity utilization was the only factor at play, it may be concluded that California should not expect the USGC to supply the entire product shortfall that will occur when the MTBE ban goes into effect at the end of 2002. Expansion of both crude and downstream units is

quite expensive and takes three to four years of planning, permitting and construction. The USGC has about 6.8 million barrels per day of refining capacity of which it is typically using 6.5 to 6.6 million barrels per day capacity. With good planning and maintenance programs average utilization may be improved by 0.5 to 1%. This means California can expect at most 30,000 to 60,000 barrels per day of product from the USGC unless imports into PADD 1 or PADD 2 reduce the demand for PADD 3 products. Over the near-term, the market may be able to reallocate tankers to this service. But with the OPA90 retirements in 2005 (See Figure 2.) there simply are not enough tankers under construction or planned to meet this additional tanker demand.

Another factor that caused alkylation capacity to fall behind its feedstock production trend was the growth



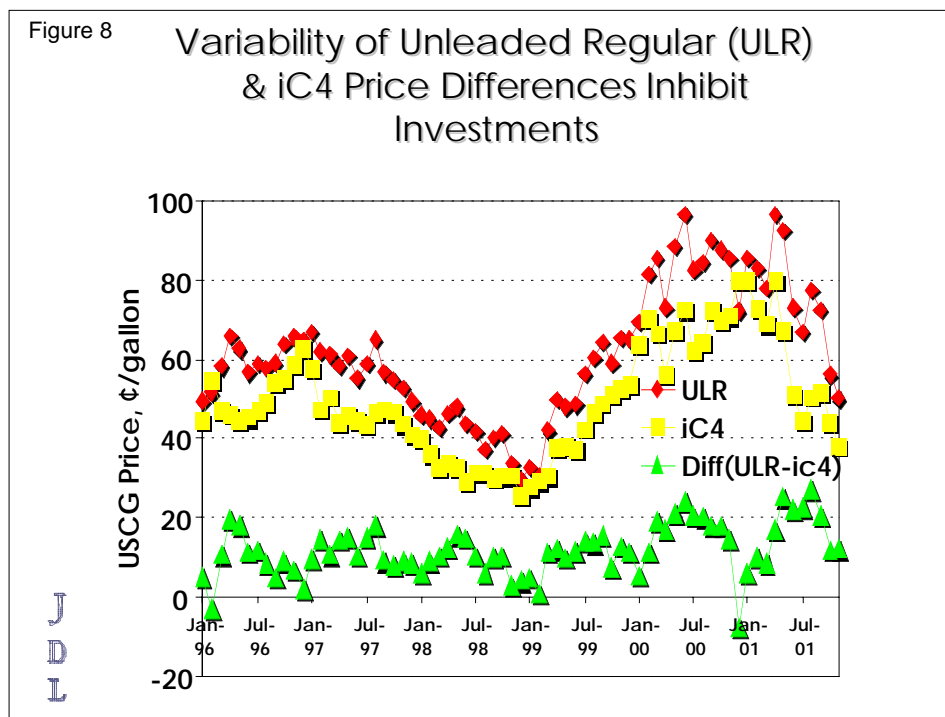
in the demand for propylene as a petrochemical. Because chemicals generally have higher values than fuels, petrochemical applications usually win the competition for feedstock. Figure 7 (at the end of document) illustrates some of those applications.

Demand for other petrochemical feedstock also affects refiners' supply of alkylate. Ethane, propane, butane, natural gasoline, naphtha, condensate and gas oil can all be used as ethylene cracker feed or fuels. As demand for petrochemicals increases these products leave refinery feedstock and blending pools. As the value of ethylene cracker feedstock decreases these products return to the refinery pool. Because these feedstocks have been fractionated and because some need little or no further processing before they are blended to fuels products ethylene cracker demand affects the supply of gasoline and distillate. However, the petrochemical competition for propylene may have the greatest impact on the USGC's ability to supply the clean burning alkylate that California needs to blend off ethanol's high blending vapor pressure while making cleaner burning gasoline (CBG). This is because the petrochemical market is a net buyer of propylene and a net seller of butylene. Propylene makes alkylate with a midpoint that is on the good side of the CBG specifications while butylene makes alkylate that has a midpoint that is on the wrong side of California's CBG specifications.

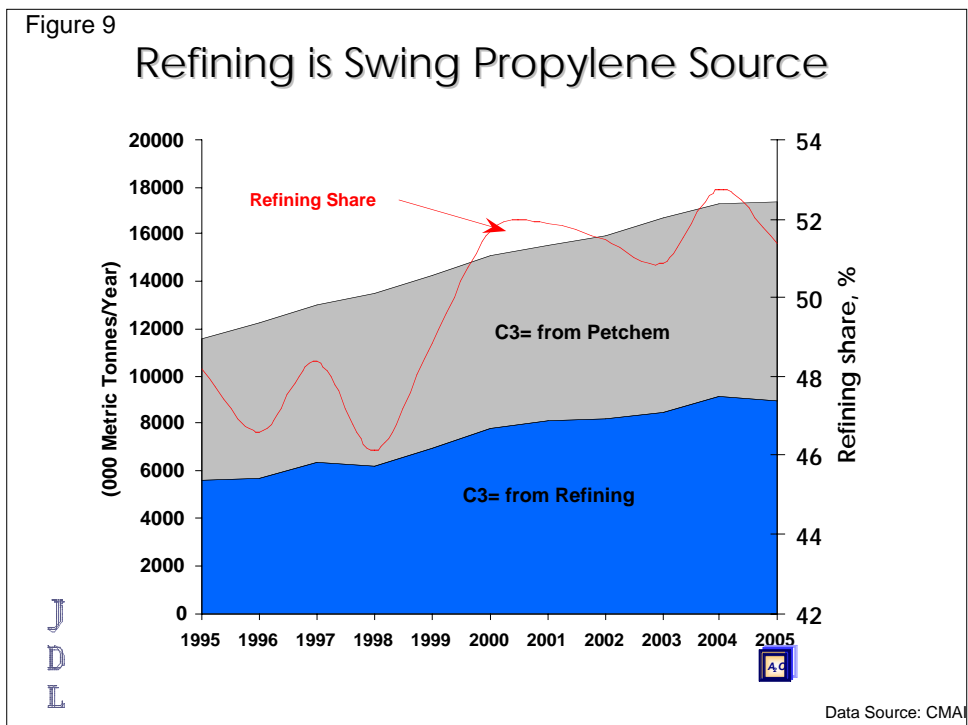
Typically propylene is more valuable to the petrochemical market than as alkylation feed in refineries. The value of alkylate to gasoline influences propylene value. As the price of propylene goes up it is difficult for the gasoline pool to buy this particular product away from the chemical market. Isobutane, the other major

feedstock to alkylation, also influences whether propylene ends up as alkylation feed or as a chemical. It takes about 1.0 gallon of propylene, 1.6 gallons of isobutane and some operating costs to make 1.8 gallons of alkylate. If isobutane is cheap relative to gasoline, propylene is valuable relative to gasoline. When isobutane is priced equal to gasoline propylene has very little value into the alkylation pool because its value must absorb the 0.8-volume loss (1.0 propylene +1.6 isobutane equals 1.8 propylene alkylate) and operating costs. This causes dramatic shifts in the amount of propylene available and the amount of alkylate available to finished gasoline products. If the petrochemical market is oversupplied with propylene, refiners are the swing propylene supply for the petrochemical industry. Refiners will bid up the isobutane price until they either use all of their alkylation capacity or depress the cracking margin until it is not economic to maximize olefin production.

Figure 8 shows how the isobutane to gasoline price varies. The significant variation in differential makes it quite difficult to make capital expenditure decisions to build more alkylate capacity.



The key principle to remember is that the olefins produced in a refiner's FCC or coker operations must go someplace or the refiner has to reduce conversion or throughput. If the economy is growing, petrochemicals will usually demand enough propylene to absorb the refiners' surplus production and may even cause refiners to under-utilize their alkylation capacity. Petrochemical producers can also change their own propylene production by shifting between light and heavy feedstocks. If propylene is valued low either due to new ethylene capacity coming on-stream, low petrochemical demand or isobutane prices that are high relative to gasoline, ethylene crackers will make less propylene. However, refiners will still be the swing propylene producers as illustrated in Figure 9.



Sources of US butylene supply are shown in Figure 10. Most butylene comes from refining FCC and coking operations. Some comes from petrochemical operations usually as a byproduct of ethylene production. A small amount is made by dehydrogenating isobutane to make isobutylene for use in the manufacturing of MTBE. Another factor in the competition between refining and petrochemicals for desirable molecules is that petrochemical butylene production exceeds petrochemical butylene demand as shown in Figure 11.

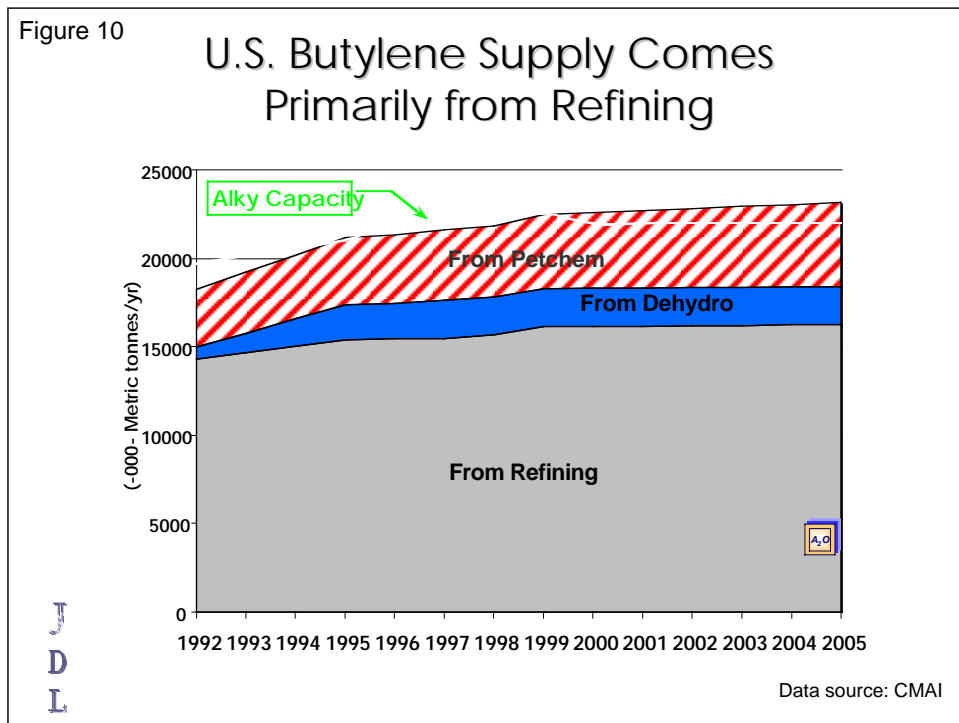
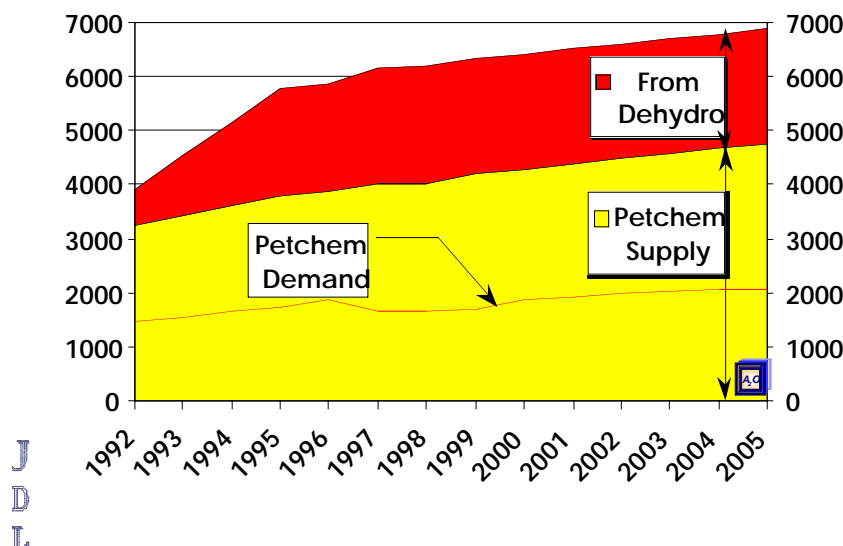


Figure 11

US Petrochemical Butylene Supply Exceeds Petrochemical Demand

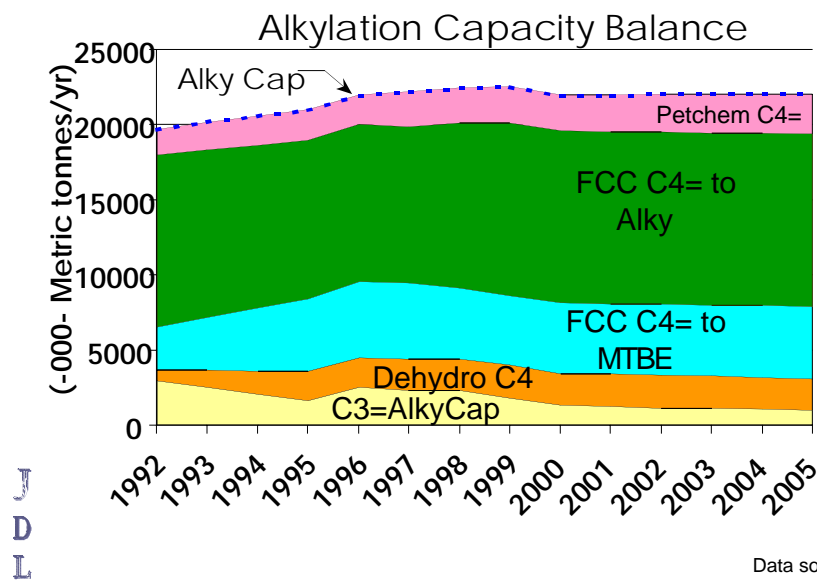


This creates a situation in which left over petrochemical butylene, refinery butylene, propylene and, if MTBE is banned, butylene from dehydrogenation, compete for alkylation capacity that has lagged behind production capacity as shown in Figure 6. Because butylene does not have another home, this lack of alkylation capacity will push propylene toward petrochemicals as shown in Figure 12.

Even if butylene is not made in the dehydrogenation process, the capacity to alkylate propylene and

Figure 12

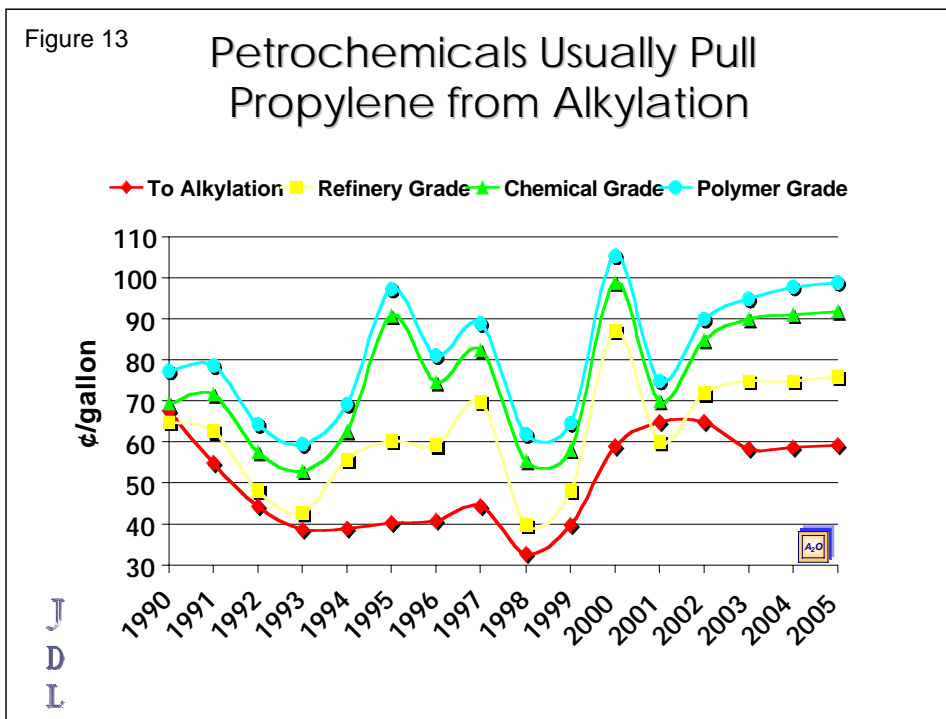
In a Growing Economy Alkylation Capacity Pushes C3= to Petrochem



Data source: CMAI

produce the light alkylate that California needs, will decrease. Because the average alkylation production is going to get heavier, California should raise the cap on gasoline midpoint temperature to make it easier to use the available butylene alkylate.

In the past economics have caused the petrochemical industry to pull propylene from the refining industry. In the future, alkylation capacity limitations may push propylene to petrochemicals. Figure 13 illustrates historical and probable future alternate disposition values for propylene.



In short, this study finds that the crude units as well as the downstream units are essentially operating at capacity in USGC refineries. The competition for the propylene needed to make light alkylate that California needs is typically used as a higher value product by the petrochemical industry. If MTBE is banned nationwide, there is not enough alkylation capacity to convert it to alkylate. But, it is still possible for the USGC to supply more of California's needs if product imports to the typical USGC markets increase. Therefore, an assessment of imports is in order.

B. Import assessment

With the USGC refineries running essentially at capacity, it is important to examine the option of freeing up USGC product for shipment to California by importing more product into the markets generally served by the USGC refineries. Importing products to the East Coast would have an impact on product distribution from the Gulf Coast. For instance, product imported to New York Harbor would require fewer products to be pumped from Houston up the Colonial Pipeline to New York Harbor. Basically, any imports to the eastern U.S. would back out barrels from the Gulf Coast region allowing barrels to then be moved to another region of the country such as the Midwest or West Coast. There are no logistical problems regarding imports to the Gulf Coast. The Gulf Coast has the advantage of a number of third party terminals, along with refineries, petrochemical plants & LPG import facilities capable of importing products. Third party terminals such as Kinder Morgan's Pasadena & Galena Park Terminals; ITC Terminal in Pasadena; Oil Tankering Terminal in Galena Park; and Unocal's Beaumont Terminal could easily handle any imports that might come to the Gulf Coast. However, imports are not expected to

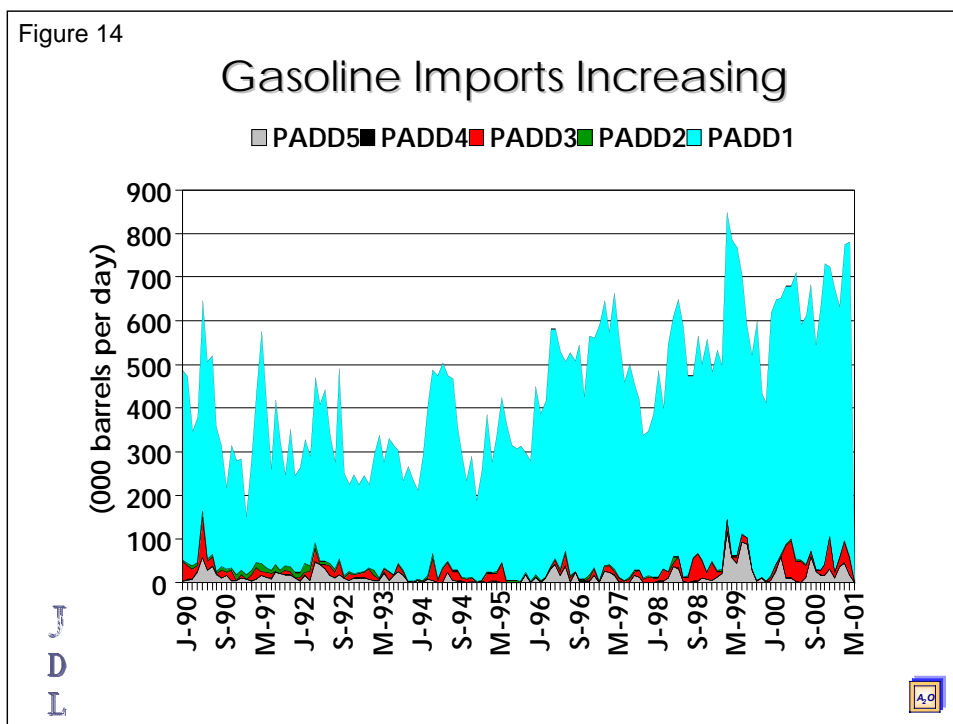
materialize into the Gulf Coast. Imported product would arrive to other ports in the Eastern United States thus backing out product from the Gulf Coast. Figure 14 shows that gasoline imports to PADD 1, the East Coast, have been increasing since the mid 1990's.

Waterborne movements of products from the USGC in PADD 3 to the Eastern states in PADD 1 have been trending downward since the mid- 1990's. Figure 15 illustrates that East Coast imports can indeed displace USGC product demand. Therefore, it is reasonable to expect that given the proper economic incentives and transportation assets that easier to produce Federal RFG and conventional gasoline imports to the East Coast can free up gasoline component volumes that can be blended to meet California's more restrictive fuel standards.

USGC demand displacement can also occur due to the extensive products pipeline network east of the Rockies. PADDs 1, 2 & 3 have extensive pipeline links. PADD 3 ships significant volumes of product to PADD 1 via the Colonial and Plantation pipelines. PADD 3 supplies PADD 2 via Explorer, Centennial and TEPPCO pipelines. PADD 1 can even import product for PADD 2 or tranship PADD 3 product to PADD 2 via the Buckeye pipeline. Moving products further west, over the Rocky Mountains, becomes difficult. There are some small pipelines that move product to Colorado from Texas. Also, some of the Texas Panhandle refineries can move product either into the pipeline network where it competes with the USGC product or toward El Paso, Tucson and Phoenix where the product competes with east bound California product.

The Longhorn Pipeline is expected to begin shipping product in mid 2002. It will initially run from Galena Park, Texas to El Paso, Texas. It will carry approximately 75,000 bbls per day of product with the potential to increase its load to 225,000 bbls per day. This is an important project for the state of California even

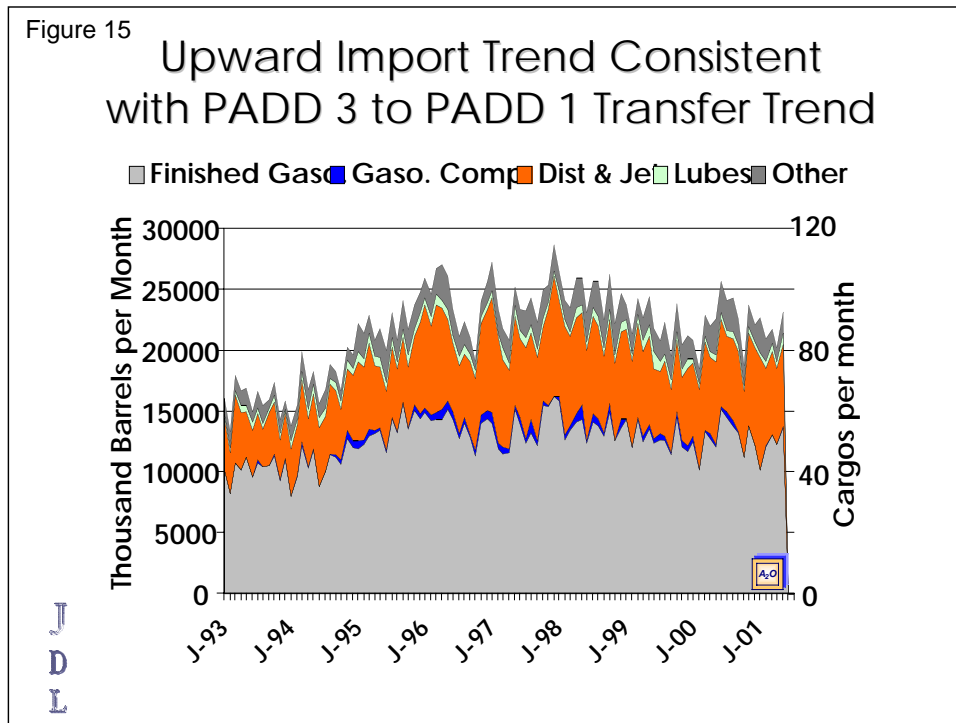
Figure 14



though none of this product will reach California because the pipeline between El Paso and Tucson is full. If the El Paso Tucson pipeline were to be expanded it could shift the demand for 100,000 bbls per day of California product to the Gulf Coast. If California acts quickly to exert its influence to get the El Paso to Tucson Pipeline expanded, California will be able to keep some of the product that has been going to Phoenix. If they go slowly, regional demand growth and possible US refinery rationalizations could

absorb the Longhorn product. Acting quickly could substantially alleviate supply problems for California refiners and may enable them to meet their own needs without having to export product to Phoenix. However, there is a risk to expanding westbound pipeline capacity. There are differences between Phoenix grade gasoline and diesel versus California grade products. Currently, refiners are using this difference to deliver a slightly inferior grade gasoline and diesel to Arizona. It may be more difficult for California refiners to make gasoline in California if they do not have this outlet for lower quality product. Nonetheless, the volume benefits outweigh this quality risk. Therefore, it is vital that the California government consider supporting the efforts of this project in order to guarantee its completion.

Even though USGC refineries are currently operating at near capacity, they are supplying product to the Tucson - Phoenix area via pipeline using this displacement principle. Price competition between USGC and inland Texas refiners currently pushes product to or pulls product from the El Paso market. The Orion pipeline can move some product from USGC to West Texas.



Even though it is more economic to import product to the East Coast and reduce USGC to East Coast movements than import directly into the USGC, the pipeline infrastructure in the Houston ship channel area can import product for Longhorn. Direct Gulf Coast imports are also feasible via third party terminals. Also, there are multiple pipelines in the Gulf Coast tying petrochemical plants into the Houston Ship Channel Area. Refineries on the Houston Ship Channel are connected via pipeline to Corpus Christi, Beaumont, Texas City and other refiners on the Ship Channel. Multiple pipelines from LPG storage facilities and petrochemical plants augment this infrastructure that is capable of blending virtually any grade of gasoline in the United States.

While Longhorn and the product displacement help, a direct West Coast pipeline would have the following advantages. A West Coast pipeline reduces deliverability time to resolve problems. It also effectively ties the West Coast to the U.S. pipeline grid. A pipeline reaching from the Gulf Coast to the West Coast would tie West Coast prices more effectively to the Gulf Coast than they have been in the past. The U.S. ability to arbitrage different regions creates a greater supply and price stability. California has not had the benefit of such infrastructure. Furthermore, a pipeline utilizes the U.S. Gulf Coast refinery, chemical and LPG infrastructure. If such a pipeline were built the West Coast price premium would decrease and there would be less potential for tanker spills and California port bottlenecks.

C. Issues that could impact supply

There are a number of issues that affect USGC product supply availability. Each issue has the potential to either increase or decrease supply. Potential issues include the usual force majeure items such as: storms, fires and mechanical breakdowns and unforeseen problems such as terrorism, war, hurricanes, and tropical storms. Pipeline disruptions, like the spring 2000 Explorer Pipeline break can create surplus product on the USGC while prices are soaring due to lack of supply on the other side of the rupture. Another factor to consider is the refinery utilization/profitability problem. Refinery utilization is extremely high and lost production is difficult to "Make Up". Panama Canal congestion and maintenance are also problems that can add seven or eight days to the typical USGC to West Coast voyage. Add to this list environmental regulatory changes such as: gasoline & diesel fuel desulfurization, Mobile Source Air Toxics and legislative changes such as: a nationwide MTBE ban, removal of the oxygen standard or the addition of a renewable fuels standard and a potential exists for supply shortage and price spikes.

Storms, fires and mechanical breakdowns are why the refining industry has both stream day and calendar day capacities. These supply disruptions tend to be temporary. Short disruptions are hardly noticed. Longer disruptions tend to cause price increases in order to attract alternate supplies. As USGC utilization rates increase, the severity and duration of price disruptions will increase.

Regulations that call for gasoline and diesel fuel desulfurization also increase the potential for higher prices and supply disruptions. Premcor has recently announced their intention to close their Hartford refinery. The same company has already shut down its Blue Island facility. Other US refiners are likely to rationalize their plants by similar closures due to projected higher cost of compliance to new US sulfur specifications. This regulation and the Longhorn pipeline may cause some New Mexico capacity to shutdown. Even without economic shutdowns, some gasoline octane and volume losses are expected and some distillate may be diverted to cracker feed. But, when forced to make changes and given adequate lead-time, refiners tweak capacity. Whether those tweaks outweigh the conversions of refineries to terminals will depend on the strength of refinery margins.

The new Mobile Source Air Toxics regulation changed the baseline gasoline toxic emissions standards for refiners. This reduces the flexibility of refiners to divert cleaner burning components like alkylate to the California market.

A nationwide MTBE ban would remove a significant volume of high-octane gasoline from market. This reduces volume of low octane components that can be blended into gasoline. If the oxygen standard stays in place, this will strain ethanol capacity due to much higher demand. Converting the butylene that has been used to make MTBE to alkylate or isooctane helps but does not offset the quality-volume loss.

If the oxygen standard were removed, refiners would tend to use less oxygenates in RFG. For MTBE blended gasoline this would reduce supply, as many refiners would like to use less MTBE. Not having to use ethanol in summer RFG could actually increase gasoline supply as increased pentane blending more than offsets the ethanol rejection.

If a renewable fuels standard replaced the oxygen standard new ethanol capacity would increase winter grade gasoline production. Summer RFG production could decrease if every gallon of gasoline had to contain ethanol. If ethanol is not forced into RFG, summer conventional gasoline volume could increase by the volume of ethanol added less the volume of butane rejected due to RVP waiver being repealed as part of the renewable fuels political deal.

World fuel standards are getting tighter. This can reduce the volume and / or quality of imports. The next big change is due in Europe in 2005. While this will not impact the 2003-supply situation, it can create a long-term supply bottleneck and deserves further study.

There are two regulatory changes that California can make that may make it easier for California to import gasoline. One is the de minimis oxygenate standard and the other is the gasoline midpoint requirement.

The Air Resources board is currently working on a de minimis MTBE standard. The current rule calls for zero oxygenates other than MTBE and ethanol. This standard needs to allow for imported product to have some unintentional MTBE contamination from tank bottoms and line flush that occurs in regions in which MTBE is used. The de minimis standard also needs to allow oxygenates other than MTBE and ethanol to be in gasoline and blendstocks. For example, if the de minimis rule does not allow some methanol, which is co-produced with ethanol, to be in the final gasoline blend, gasoline suppliers would have to choose between breaking the Federal RFG laws or the California de minimis laws.

With the petrochemical industry usually bidding propylene away from the refining industry alkylate needed to blend off ethanol's vapor pressure will get heavier. To make sure that refiners can use this heavier alkylate, California should increase the maximum T50 specification. California can rely upon the Predictive Model to preserve air quality performance while giving gasoline producers more flexibility.

Conclusions

USGC refiners can increase supply to California by optimizing their operations and product mix and by letting imports displace some of their current product demand. Imports of RFG gasoline and conventional gasoline are currently available and can help California supply by direct shipment to Arizona. However, supply of clean blendstocks such as alkylate and finished CARB gasoline could be in very short supply until Gulf coast refiners have enough incentive to invest in new equipment and technology. Gulf coast refiners will be required to lower sulfur in gasoline in 2005. Additional investment will still be required in order to produce CARB type gasoline. Refiners will make the needed investment if the refiners perceive the opportunity to achieve consistent higher margins. However, there may be a gap in supply during the period of permitting and construction, which could last three to four years.

If Arizona adopts CARB type specification, USGC supplies may be even more limited. The increased demand for cleaner fuels in the entire US will make competition for clean gasoline more difficult for California and, an expected national ban of MTBE will further tighten the competition for clean supplies.

A Texas to California pipeline would add supply and reduce California fuel costs if clean blendstocks and CARB gasoline can be supplied. California should have reduced price volatility if a West coast pipeline tied the California market closer to the Gulf Coast.

Plastic Products Derived From Propylene

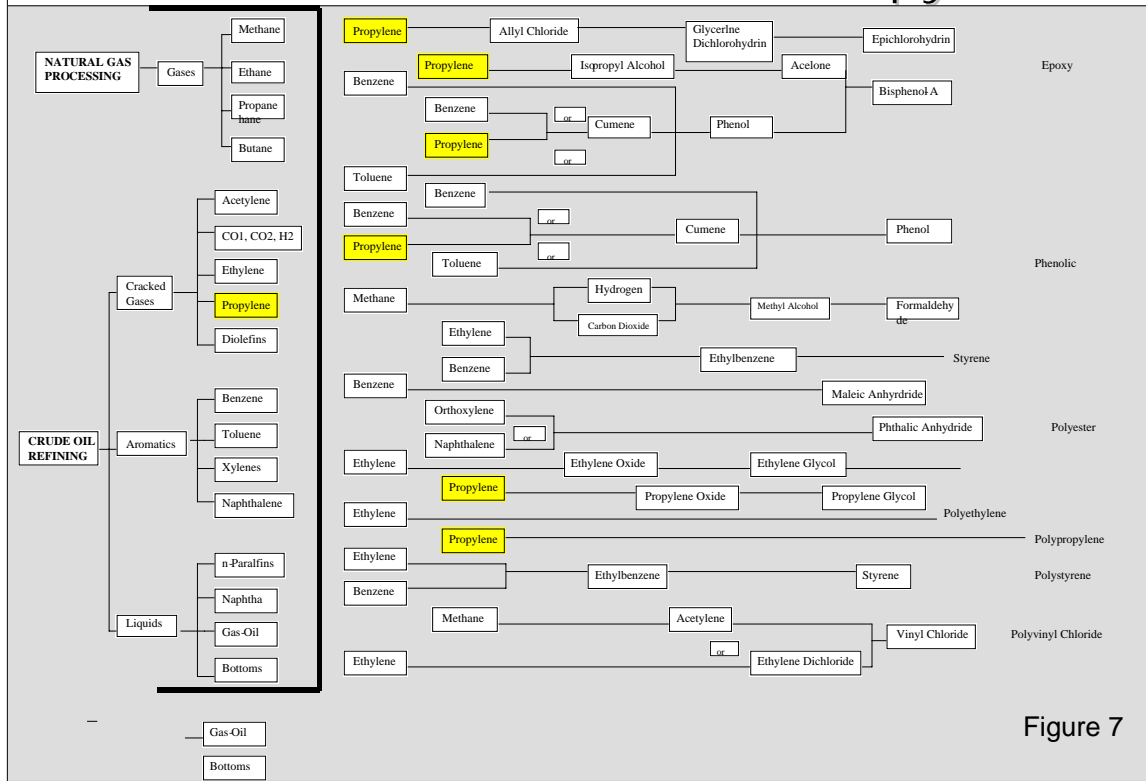


Figure 7